

AMENDMENTS TO CLAIMS

1.(Deleted)

2. (Currently Amended) An apparatus ~~of~~ for compensating for a frequency offset using a pilot symbol for a transmitter in an OFDM/CDMA system including a receiver for performing fine frequency synchronization using a pilot symbol, comprising:

 a pilot symbol inserter for receiving a spread data symbol stream, and inserting a pilot symbol at intervals of predetermined data symbols;

 a serial-to-parallel (S/P) converter for receiving the pilot symbol-inserted data symbol stream, and outputting N data samples of a symbol unit in parallel;

 an inverse fast Fourier transform (IFFT) section for performing an IFFT operation on the N data samples;

 a parallel-to-serial (P/S) converter for serializing the IFFT-transformed N data samples and outputting an OFDM symbol; and

 a guard interval inserter for copying a part of the N data samples of the OFDM symbol and inserting the copied data samples in the front of the OFDM symbol.

3.(Deleted)

4. (Currently Amended) An apparatus for compensating a frequency offset using a pilot symbol for a receiver in an OFDM/CDMA system including a transmitter for inserting a pilot symbol in a data symbol of frame unit in a specific pattern before transmission, comprising:

a carrier synchronizer for compensating for a fine frequency offset using the pilot symbol inserted in the specific pattern of an IFFT-transformed data symbol stream. ~~The apparatus as claimed in claim 3,~~ wherein the carrier synchronizer comprises:

a pilot symbol detector for detecting a pilot symbol from an OFDM-demodulated data symbol stream;

a delay for delaying the detected pilot symbol by a predetermined time;

a phase difference detector for detecting a phase of the pilot symbol output from the pilot symbol detector and a phase of the delayed pilot symbol output from the delay, and calculating a phase difference between the two pilot symbols;

an averager for calculating a fine frequency offset by averaging the phase differences in a frame unit and outputting a second frequency offset compensation signal according to the fine frequency offset; and

a second frequency offset compensator for compensating for a fine frequency offset of the demodulated data symbol according to the second frequency offset compensation signal.

5. (Currently Amended) An apparatus ~~of~~ for compensating for a frequency offset using a pilot symbol for a receiver in an OFDM/CDMA system including a transmitter for inserting a pilot symbol in a data symbol stream of a frame unit in a specific pattern before transmission, comprising:

a first carrier synchronizer for receiving an OFDM symbol stream including received guard intervals and performing approximate frequency synchronization on the received OFDM symbol stream using the guard intervals;

a guard interval remover for removing the guard intervals from the OFDM symbol streams after performing frequency synchronization;

a fast Fourier transform (FFT) section for performing an FFT operation on the guard interval-removed OFDM symbol stream and outputting ~~the~~ a data symbol stream; and

a second carrier synchronizer for compensating for a fine frequency offset using the pilot symbol inserted in the data symbol stream in the specific pattern.

6. (Original) The apparatus as claimed in claim 5, wherein the first carrier synchronizer comprises:

- a guard interval detector for detecting a guard interval from the OFDM symbol stream;

- a copied sample detector for detecting data samples copied to create the detected guard interval, from the OFDM symbol stream;

- a phase difference detector for calculating a phase of the data samples of the detected guard interval and a phase of the copied data samples, and calculating a phase difference between the two data samples;

- an averager for calculating a frequency error by averaging the phase differences output from the phase difference detector in the frame unit, and outputting a first frequency offset compensation signal according to the frequency offset; and

- a first frequency offset compensator for compensating for a frequency offset of the OFDM symbol according to the first frequency offset compensation signal.

7. (Currently Amended) The apparatus as claimed in claim 5, wherein the second carrier synchronizer comprises:

- a pilot symbol detector for detecting the pilot symbol from the data symbol stream;

- a delay for delaying the pilot symbol by a pilot symbol insertion period;

- a phase difference detector for detecting a phase of a pilot symbol output from the pilot symbol detector and a phase of the delayed pilot symbol output from the delay, and calculating a phase difference between the two pilot symbols;

- an averager for calculating a fine frequency offset by averaging the phase differences received in the frame unit, and outputting a second frequency offset compensation signal according to the fine frequency offset; and

a second frequency offset compensator for compensating a fine frequency error of the demodulated data symbol according to the second frequency offset compensation signal.

8. (Original) The apparatus as claimed in claim 7, wherein the fine frequency offset is calculated by

$$k_e = \frac{avg\ diff_{phase} \times N}{2\pi[N + G] \times I}.$$